FORM PTO/SB/29 (12/97)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

CONTINUATION APPLICATION REQUEST TRANSMITTAL FORM 37 C.F.R. §1.53(b)

DOCKET NO.	ANTICIPATED CLASSIFICATION OF THIS APPLICATION:		PRIOR APPLICATION 08/699,275	
2685/5226	CLASS	SUBCLASS	EXAMINER K. Yao	ART UNIT 2731

Address to:
Assistant Commissioner for Patents
Washington D.C. 20231

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This is a request for filing a **continuation** application under 37 C.F.R. § 1.53(b) of pending prior application Serial No. **08/699,275**, filed on **August 19, 1996,** entitled **METHOD AND APPARATUS FOR TRANSMITTING HIGH RATE PACKET DATA OVER UNDER-UTILIZED VIRTUAL CIRCUITS**

Enclosed are:

1. 6 sheets of specification, 4 sheets of claims , 1 sheet of abstract; and 2 sheets of drawings.

The filing fee is calculated below:

	NUMBER FILED	NUMBER EXTRA*	RATE ($)	FEE ($)
BASIC FEE				760.00
TOTAL CLAIMS	28 - 20 =	8	18.00	144.00
INDEPENDENT CLAIMS	2 - 3 =	0	78.00	0.00
MULTIPLE DEPENDENT CLAIM PRESENT			260.00	
*Number extra must be zero or larger			TOTAL	904.00
If Applicant is a small entity under 37 C.F.R. §§ 1.9 and 1.27, then divide total fee by 2, and enter amount here.			SMALL ENTITY TOTAL	

2. Preliminary Statement

3. Please charge the required application filing fee of **$904.00** to the deposit account of **Kenyon & Kenyon**, deposit account number **11-0600**.

4. The Commissioner is hereby authorized to charge payment of the following fees, associated with this communication or arising during the pendency of this application, or to credit any overpayment to the deposit account of **Kenyon & Kenyon**, deposit account number **11-0600**:

A. Any additional filing fees required under 37 C.F.R. § 1.16;
B. Any additional patent application processing fees under 37 C.F.R. § 1.17;
C. Any additional patent issue fees under 37 C.F.R. § 1.18;
D. Any additional document supply fees under 37 C.F.R. § 1.19;
E. Any additional post-patent processing fees under 37 C.F.R. § 1.20; or
F. Any additional miscellaneous fees under 37 C.F.R. § 1.21.

Dated: July 28, 1999

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GP. 2731

EXAMINING GROUP 2731

PATENT
2685/5226

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

INVENTORS : JAVITT et al.

SERIAL NO : Unassigned

FILING DATE : July 28, 1999

TITLE : METHOD AND APPARATUS FOR TRANSMITTING HIGH RATE PACKET DATA OVER UNDER-UTILIZED VIRTUAL CIRCUITS

Group Art Unit:2731

Examiner: K. Yao

Assistant Commissioner for Patents
Washington, DC 20231

PRELIMINARY STATEMENT

S I R:

Preliminary to examination on the merits, Applicants would like the Examiner to please consider the following remarks.

REMARKS

Applicants wish to thank the Examiner for courtesies extended in the personal interview on July 27, 1999. Applicants further wish to use the following remarks to remind the Examiner of the substance of that personal interview. Specifically, Applicants desire to use the following remarks to remind the Examiner of Applicants' position with regard to references cited against the claims in the parent case.

Procedural History

The application accompanying the Preliminary Statement claims priority to U.S. Application No. 08/699,275. In a final Office Action with regard to that parent case, the Examiner advised Applicants that two claims, claims 15 and 31, would be allowed if rewritten in independent form. Applicant has done that. Additionally, in a personal interview

conducted after the final rejection in that case, Applicants agreed to file this continuation along with the remaining claims from the parent application.

In that personal interview, Applicants and the Examiner agreed that Applicants would file a continuation application claiming priority to that application. Additioanlly, the Examiner requested that this preliminary statement accompany the continuation to remind the Examiner of Applicants' arguments made during the personal interview.

Applicants' Arguments With Respect to the Cited References

The Claims Contain a Limitation Not Found in the Cited References

In the parent case, the Examiner rejected the remaining claims under 35 U.S.C. § 103 as obvious in light of the combination of U.S. Patent No. 5,093,924 (hereinafter "Toshiyuki"), U.S. Patent No. 5,784,363 (hereinafter "Engstrom"), and U.S. Patent No. 5,408,681 (hereinafter "Ressler"). Without conceding the appropriateness of Examiner's characterizations of the prior art or of the application, it is respectfully submitted that the claims are allowable because they contain at least one limitation that is not found in the prior art. In particular, the references fail to disclose the following limitation:

> simultaneously transmitting a given set of packet data from a base station to a given terminal over a plurality of frequencies from a list of optimal frequencies identified for the given terminal.

Using independent claim 1 as an exemplary claim, the Examiner notes in the Office Action that the above-referenced recitation from claim 1 is missing from both Toshiyuki and Engstrom, either alone or in combination. The Examiner attempts to make up for the missing limitation by citing Ressler, stating that Ressler discloses an automatic repeater station simultaneously transmitting signals over a range of frequencies. Without conceding the Examiner's characterization of Ressler, it is respectfully submitted that Ressler does not disclose the above-referenced recitation from the present invention, for at least the following reasons.

Claim 1 recites simultaneously transmitting a given set of packet data from a base station to a given terminal. From the specification in the application, one can plainly see that the recitation refers to transmitting simultaneously a message ("a given set of packet data")

over more than one channel. This message is then received at a terminal (the recipient of the message) over the plurality of channels, and then reassembled into the message.

This feature of the present invention is clearly not disclosed in Ressler. Rather, Ressler involves transmitting "signals" from a plurality of antennae over a plurality of channels. (See Ressler, col. 2, lines 23-29) These "signals"are not a single message ("a given set of packet data") as is recited in claim 1 of the present invention. Of course, the repeater station in Ressler is responsible for sending many "signals," and does so over a plurality of channels. This feature, however, is completely different from the present invention, which recites a single message sent simultaneously over a plurality of channels.

Thus, because at least this limitation does not exist in the prior art, it is respectfully submitted that independent claim 1 distinguishes over the prior art and so is allowable.

Additionally, because all the claims in the application either contain the above-mentioned recitation, or depend from a claim that contains the above-mentioned recitation, it is respectfully submitted that all the claims are allowable, for at least the reason given above.

The References Are Not Properly Combinable

When a rejection depends upon a combination of prior-art references, there must be some teaching, suggestion, or motivation to combine the references. "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references". See Ex Parte Clapp, 227 USPQ 972, 973 (BPAI 1985). See MPEP 706.02(j). Neither Toshiyuki, Engstrom, nor Ressler contain such a teaching, suggestion or motivation, and the Examiner does not provide any detailed explanation of why such a combination is suggested.

Thus, even if all the claim limitations in the present application were found to exist in the prior art, the Examiner has not detailed a suggestion to combine the three cited references, and so there no a prima-facie case of obviousness.

Conclusions

Applicants respectfully request favorable action in connection with this continuation application.

The Examiner is invited to contact the undersigned at (202) 220-4200 to further discuss any matter concerning this application.

The Office is hereby authorized to charge any additional fees or credit any overpayments under 37 C.F.R. § 1.16 or § 1.17 to Deposit Account No. 11-0600.

Respectfully submitted,

KENYON & KENYON

Dated: July 28, 1999

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2685/4087/197234

METHOD AND APPARATUS FOR TRANSMITTING HIGH RATE PACKET DATA OVER UNDER-UTILIZED VIRTUAL CIRCUITS

CROSS REFERENCE TO APPLICATION

This application is a continuation of U.S. Patent Appln. No. 08/699,275, filed on August 19, 1996 and entitled METHOD AND APPARATUS FOR TRANSMITTING HIGH RATE PACKET DATA OVER UNDER-UTILIZED VIRTUAL CIRCUITS.

FIELD OF THE INVENTION

This invention relates to communications systems, and more particularly to wireless communications systems.

BACKGROUND OF THE INVENTION

Although communication systems take many forms, the general purpose of a communication system is to transmit information from a source to a destination located some distance away. As a result, communication systems basically consist of a transmitter, a channel and a receiver. The function of the transmitter is to process some original message (i.e. information to be communicated) into a form suitable for transmission over the channel. The channel, in turn, provides a physical connection between the transmitter and the receiver so that the message can be communicated therebetween. The receiver, therefor, has the function of processing the received signal and reproduce the original message.

Before transmitting the original message, however, the transmitter must manipulate the original message into a form suitable for transmission over the channel. The process of manipulating the original message into a transmission signal is called modulation. In general, modulation involves varying some parameter of a carrier wave with the message signal in such a way that the spectrum of the modulated wave matches the bandwidth of the channel over which the message is communicated. Once modulated, the signal is transmitted over the channel to the receiver, which,

as stated above, recreates the original signal from the modulated signal. This process is called demodulation. As a result, communications systems can be said to transmit information through a series of modulation/demodulation processes over the channel.

Hencetofore, wireless communications systems are configured to transmit packet data from a transmitting unit to a receiving unit over a single dedicated channel. That is, in a packet data wireless systems the transmitting unit and receiving unit communicate over a single channel dedicated to the transmission of data. This configuration was developed to reduce software and hardware complexity at the terminal and network side, as well as minimize possible disruption to any incumbent voice communication system. Thus, the overall data rage of such present day system is limited to the data rate supported by that given single channel.

With the advent of more varied and customized wireless user services, such present day systems have come under pressure to provide ever increasing bit rates. Moreover, those skilled in the art have found that such present day systems do not adequately provide the desired services (i.e. bit rates) without sacrificing system performance and efficiency. Thus, there is a need for a wireless packet data communication system that enables high-rate packet data communications between communicating units, without sacrificing system performance and efficiency.

SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to a wireless communications system that provides high packet data rates without compromising system performance and efficiency. To attain this, the present invention provides a method and apparatus for providing multi-channel packet data communications to a single user.

In one embodiment, a wireless communications system is configured with one base station that transmits to one of a plurality of receiver stations over a given set of carrier frequencies at a given time. In general, a list of optimal frequencies is determined for transmitting packet data from the base station to a given receiver station. The optimal frequencies represent the set of channels through which the base station can successfully transmit packet data to the receiver station without having to increase the carrier energy over some predetermined carrier energy level. These data packets are delivered to the receiver station over any number of frequencies selected from the list of

optimal frequencies. Since such frequencies can be voice-committed or data packet committed frequencies, the data packet delivery can be over a voice-committed frequency, a data-committed frequency, or a combination of voice-committed and data-committed frequencies. In any event, the wireless communication system of the present invention provides the ability to utilize a plurality of channels (i.e. frequencies) at any given time, to transmit packet data to a single user. Thus, the present invention overcomes to a large extent the limitations of the prior art.

These and other features of the invention are described in more detail in the following detailed description of the embodiments of the invention when taken with the drawings. The scope of the invention, however, is limited only by the claims appended hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an illustrative embodiment of a wireless communications system providing multi-channel communications to a single user according to the present invention.

Fig. 2 is a block diagram illustrating the steps for providing the multi-channel communications to a single user.

DETAILED DESCRIPTION

Referring now to Fig. 1, there is shown one embodiment of a wireless communications system providing multi-channel communications to a single user according to the present invention, hereinafter referred to as system 10. As shown, system 10 has a base station 11 communicating with receiver stations 12-14 over a given set of a available frequencies 21-2N which form communications paths 15 and 16. Communications paths 15 are the first paths formed when the base station 11 transmits data packets to receiver stations 12-14. Communications paths 16 are formed when base station 11 transmits packet data to receiver stations 12-14 through a second path, simultaneous with the first path. Base station 11 has a separate buffer 31 and 32 dedicated to each receiver station 13 and 14, respectively. That is, buffer 31 is dedicated to receiver station 13 and buffer 32 is dedicated to receiver station 14.

In operation, base station 11 is operable to maintain a list of optimal frequencies for each receiver station to identify the frequencies over which the receiver stations 12-14 can receive a carrier

signal having a signal level greater than a given level, wherein the given level can be predetermined to insure that a strong enough signal reaches the receiver unit for any given coding used to communicate thereto. As a result, base station 11 can select any of a plurality of frequencies from the list of optimal frequencies for a given unit when transmitting packet data to that given unit. Thus, enabling the simultaneous transmission of different data packets of different frequencies 21-2N to a single unit.

In one embodiment, base station 11 maintains a list of optimal frequencies over which packet data can be reliably transmitted from base station 11 to the receiver stations without increasing the carrier energy above a predetermined desired carrier level. That is, base station 11 keeps a separate list of optimal frequencies for each receiver station to which it communicates packet data. As a result, in determining whether a frequency is optimal for transmitting data to a particular receiver station, base station 11 must compare the actual carrier energy required to reliably send information over a particular frequency to a predetermined desired carrier level. As a result, the predetermined desired carrier level may be updated periodically by base station 11 or pre-set by software loaded in a controller housed in the base station.

In one method of measuring the actual carrier energy level required for reliable communications over the available frequencies, the receiver stations 12-14 first take RF level measurements for each radio frequency 21-2N over which data is received. The RF measurements are then reported to base station 11 which, in turn, determines whether the measured level is above the predetermined desired carrier level described above. Then, the base station identifies each frequency having a measured RF level above the predetermined desired level, and saves that frequency to the list of optimal frequencies, described above. As a result, base station 11 can maintain a list of optimal frequencies for each receiver station communicating on the system.

Buffers 31 and 32 are used to buffer packet data awaiting delivery from base station 11 to receiver stations 13 and 14, respectively. The buffered data can be transmitted from base station 11 to receiver stations 12-14 over any number of frequencies selected from the list of optimal frequencies. Since these optimal frequencies can be either voice-committed or packet data-committed frequencies on system 10, base station 11 can transmit the packet data over voice-committed frequencies, data-committed frequencies, or a combination of such frequencies at the same time. If,

however, the selected frequency is voice-dedicated, base station 11 must insure that the packet data is sent only during inactive voice periods. In addition, prior to using voice-committed frequencies, base station 11 can send an escape sequence to instruct the receiver station to ignore the data and insert background noise. Moreover, to prematurely terminate a packet and insure that speech resumption is not delayed, base station 11 can send an escape sequence to the respective receiver station 12-14 to which it communicated the packet data. As a result, base station 11 should be operable to detect the end of a speech period and abruptly stop sending data packets over the inactive voice-committed channel. In any event, base station 11 can continuously monitor and updates the list of available frequencies that can be instantaneously seized for data transmission.

In one embodiment, the wireless communications system may be a fixed wireless access (FWA) system, comprised of a plurality of base stations and receiving stations, having full duplex voice communications paths using either discrete independent channels of a standard wireless air-interface protocol or virtual channels of a stacked carrier system. In such an embodiment, data packet communication from the base stations to the receiver stations may be accomplished through a high rate packet service (HRPS). The HRPS may be capable of voice, voiceband data, and FAX services, and may be operable to provide solely asymmetric communications services (e.g. downlink only) or alternatively to provide interactive communication service.

Referring now to Fig. 2 there is shown a block diagram of one method of providing multi-bearer path data communications in a wireless communication system. As shown, the packet data intended for delivery from a base station to a receiver station is queued in a dedicated buffer at step 41. The base station, at step 42, then receives RF measurements of the signal level for each available system frequency over which the base station can communicate the packet data to the receiver stations. The base station at step 44, then determines whether the received RF level is above some predetermined desirable level. If so, the frequency corresponding to that level is saved to a set of optimal frequencies, at step 45, otherwise the frequency is discarded at 46. Once, the set of optimal frequencies is determined, the desired transmission criteria is determined at step 47 (e.g. data only, simultaneous transmission, etc.). Once the transmission criteria is determined, the frequency of frequencies, over which the transmission criteria is satisfied, are chosen at step 48. Then the buffered

data is sent to the receiver station over the selected frequency or frequencies at step 49. This process can be repeated for each base unit communicating with each receiver station.

The above description includes exemplary embodiments and methods of implementing the present invention. References to specific examples and embodiments in the description should not be construed to limit the present invention in any manner and is merely provided for the purpose of describing the general principles of the present invention. It will be apparent to one of ordinary skill in the art that the present invention may be practiced through other embodiments. For example, in another embodiment, the terminals 12-14, as shown in Fig. 1, may be operable to maintain a list of optimal frequencies for transmission from the terminals to the base station thus providing efficient two-way communications over the available carrier frequencies.

CLAIMS

1. A method for communicating data in a wireless communications system having a base station communicating to at least one of a plurality of terminals over a set of carrier frequencies, the method comprising:

a. periodically monitoring the carrier energy level of each said carrier frequency received at a given terminal to identify a list of optimal frequencies over which the carrier energy level is strong enough to maintain a viable transmission from said base station to said given terminal, wherein said viable transmission provides a given coding gain; and

b. simultaneously transmitting a given set of packet data from said base station to said given terminal over a plurality of frequencies from said list of optimal frequencies identified for said given terminal.

2. The method of claim 1, further comprising the step of maintaining a buffer for buffering data packets to be transmitted from said base station to said given terminal.

3. The method of claim 1, further comprising the step of transmitting a given set of data packets from said given terminal to said base station over two frequencies selected from said list of optimal frequencies identified therefor.

4. The method of claim 1, further comprising the step of repeating steps a and b for each said terminal of said wireless communications system.

5. The method of claim 1, wherein said step of periodically monitoring the carrier energy level of said carrier frequencies comprises the steps of:

a. receiving, at said base station, RF measurements of the carrier level of each carrier received at said given terminal via a radio transmission; and

b. selecting at said base station each carrier frequency having an RF measurement greater than a predetermined RF level to form said list of optimal frequencies, wherein

said predetermining RF level represent a minimum level for supporting a given coding gain.

6. The method of claim 1, wherein said carrier frequencies comprise voice dedicated frequencies and data packet dedicated frequencies.

7. The method of claim 6, wherein said list of optimal frequencies comprises voice dedicated frequencies and data packet dedicated frequencies.

8. The method of claim 7, wherein said step of transmitting said packet data to said given terminal further comprises the steps of:

transmitting said data packets during inactive voice periods when transmitting on said voice dedicated frequencies; and

transmitting said data packets over a plurality of frequencies when transmitting on said packet data dedicated frequencies.

9. The method of claim 1, wherein said wireless system is a fixed wireless access system.

10. The method of claim 9, wherein each said carrier frequency provides full duplex communication path for communications between said base station and said given terminal.

11. The method of claim 10, wherein said full duplex communication paths comprise discrete independent virtual voice channels.

12. The method of claim 11, wherein said full duplex communication paths comprise virtual voice channels.

13. A wireless system for communicating packet data, comprising:

a base station; and

a given set of carrier frequencies over which said base station and at least one terminal communicate said packet data;

each said terminal being operable to periodically monitor each frequency of said set of carrier frequencies to identify a list of optimal frequencies over which the carrier energy level is strong enough to maintain a viable transmission having a given coding gain;

said base station being operable to transmit simultaneously said packet data to a given terminal over a plurality of frequencies from said list of optimal frequencies identified by said given terminal.

14. The wireless system of claim 13, wherein each said terminal is operable to transmit said packet data to said base station over at least one of said list of optimal frequencies identified by said terminal.

15. The wireless system of claim 14, wherein said list of frequencies over which said base station transmits said packet data to said given terminal comprises voice-dedicated frequencies and data packet dedicated frequencies.

16. The wireless system of claim 15, wherein said base station transmits said data packet over said voice dedicated frequencies during inactive voice periods.

17. The wireless system of claim 16, wherein said base station transmits said packet data over a plurality of data packet dedicated frequencies and a voice dedicated frequency.

18. The wireless system of claim 13, wherein each said terminal is operable to report said list of optimal frequencies to said base station.

19. The wireless system of claim 18, wherein said base station is operable to store said reported list of optimal frequencies for each said terminal.

20. The wireless system of claim 13, wherein the system is a fixed wireless access system.

21. The wireless system of claim 20, wherein each of said carrier frequencies provides a full duplex voice communication path for communications between said base station and said at least one terminal.

22. The wireless system of claim 21, wherein said full duplex voice communication paths comprise discrete independent channels.

23. The wireless system of claim 20, wherein said full duplex voice communication paths comprise virtual channels.

24. The wireless system of claim 23, wherein said base station maintains a buffer for temporarily storing said data packets being sent to said at least one terminal.

25. The wireless system of claim 13, wherein said at least one frequency over which said base station transmits said data packets to said given terminal has an inactive voice period thereon.

26. The wireless system of claim 13, wherein at least one frequency over which said base station transmits said packet data to said given terminal comprises two radio frequencies.

27. The wireless system of claim 13, further comprising a controller for maintaining said list of optimal frequencies for each said terminal.

28. The wireless communications system of claim 27, wherein said controller implements a carrier level means to form said list of frequencies, said carrier level means comprising the steps of:

a. receiving at said base station RF measurements, of each carrier frequency received at each terminal, via a radio transmission; and

b. identifying radio frequencies having a received RF measurement greater than a given level to form said list of optimal frequencies.

ABSTRACT

A method for communicating data in a wireless communications system having a base station communicating to at least one of a plurality of terminals over a set of carrier frequencies, the method comprising periodically monitoring the carrier energy level of each said carrier frequency received at a given terminal to identify a list of optimal frequencies over which the carrier energy level is strong enough to maintain a viable transmission from said base station to said given terminal, wherein said viable transmission provides a given coding gain; and simultaneously transmitting a given set of packet data from said base station to said given terminal over a plurality of frequencies from said list of optimal frequencies identified for said given terminal.

JAVITT 3

1/2

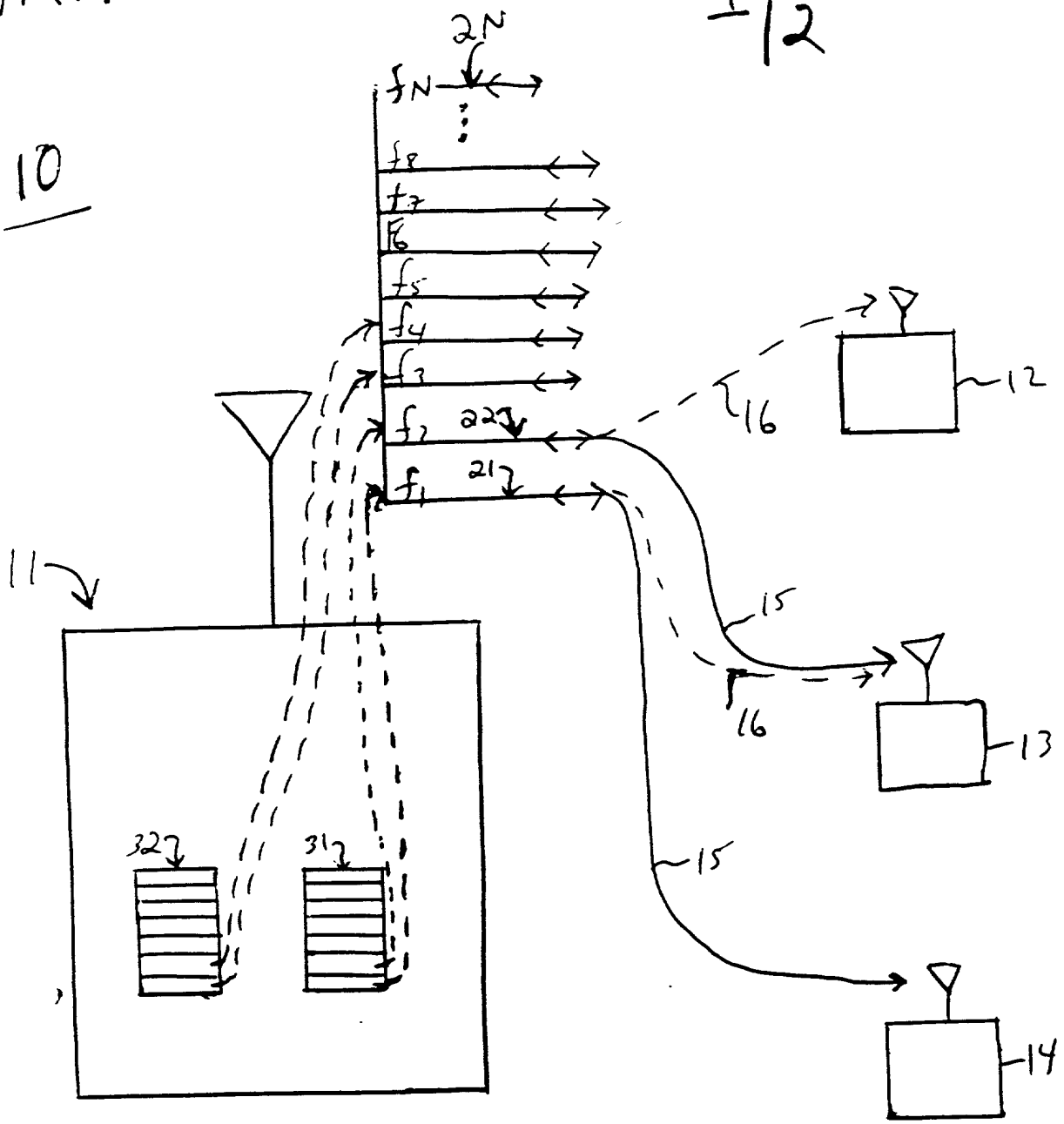

FIG. 1

JAVITT 3-1

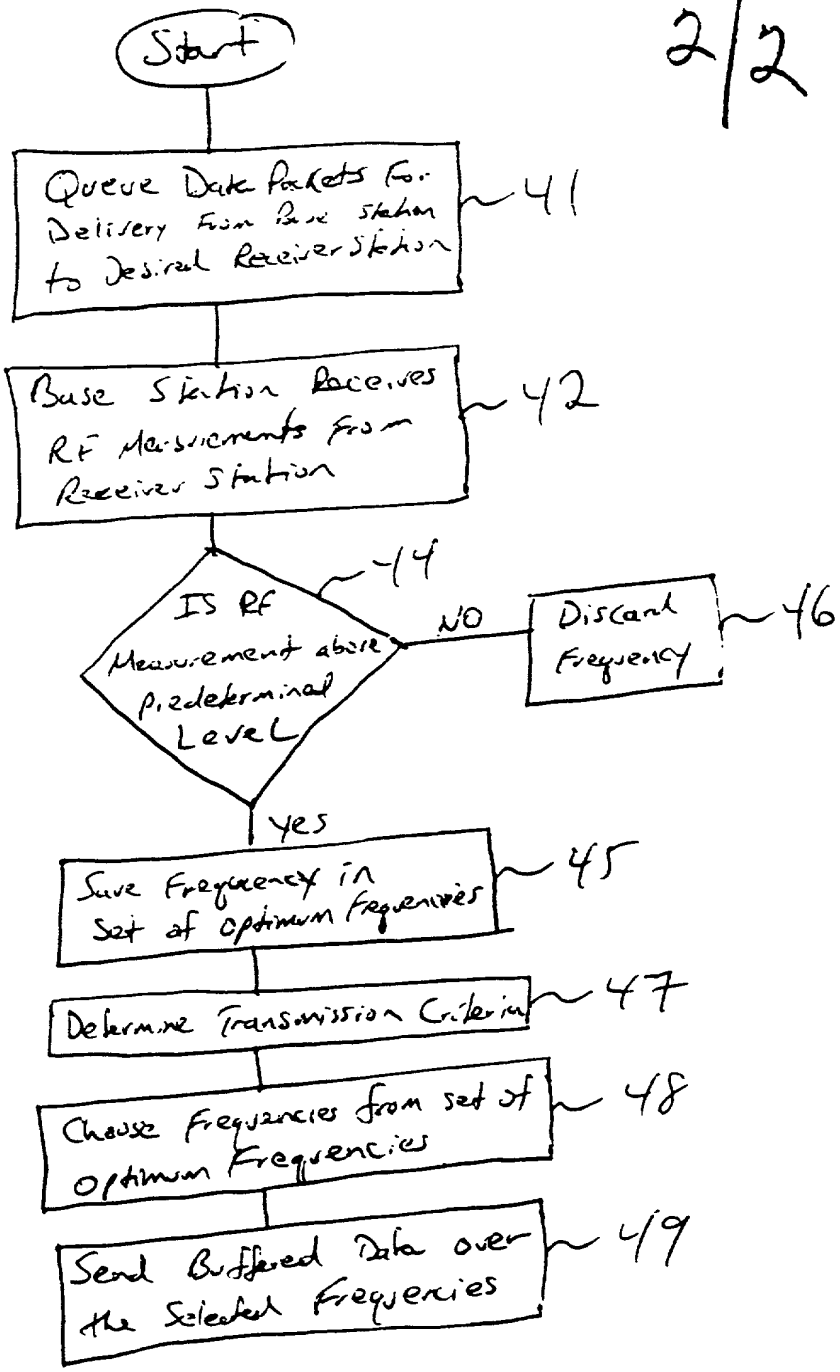

FIG. 2

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

PATENT APPLICATION

Inventor(s)	Joel I. Javitt J. Frederick Stevenson	
Case	12-2	
Serial No.	08/699,275	Group Art Unit 2731
Filing Date	August 19, 1996	
Examiner	K. Yao	
Title	Method and Apparatus for Transmitting High Rate Packet Data Over Under-Utilized Virtual Circuits	

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of Kenyon & Kenyon as associate attorneys in the above-mentioned application, with full power to prosecute said application, to make alterations and amendments therein, and to transact all business in the Patent and Trademark Office connected therewith.

Please direct all written correspondence in this application, as previously stated, to Kenyon & Kenyon, 1025 Connecticut Ave., N. W., Washington, D. C. 20036 and please direct all telephone calls in this application to Frank Pietrantonio by dialing 202 429 1776.

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